

REMARKSAmendments to the Claims

Applicants respectfully submit that the amendments to the claims find support in the application as originally filed. Specifically, support is found on Page 11, Paragraph 27, Page 14, Paragraph 35, Pages 16-18, Paragraphs 41-43, Page 20, Paragraph 48, Page 21, Paragraph 50, and Pages 23-24, Paragraph 57 of the specification, as well as FIG. 5. Therefore, Applicants respectfully submit that no new matter has been introduced by the amendments to the claims and that the claims are currently in condition for allowance.

Claim Rejections – 35 U.S.C. §103

Claims 1-2, 13, 16, 23, 29, 40 and 42-46 stand rejected under 35 U.S.C. §103(a) as being unpatentable over McCollum (US 5,789,764) in view of Takagi et al. (US 5,550,400).

For a §103 obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. MPEP 2143.

Claim 1 has been amended to incorporate the subject matter of Claim 2 and recites a reprogrammable metal-to-metal antifuse comprising "... a lower adhesion-promoting layer disposed over said lower Ti barrier layer; an antifuse material layer disposed above an upper surface of said lower adhesion-promoting layer, said antifuse material layer

selected from a group comprising at least one of amorphous carbon and amorphous carbon doped with at least one of hydrogen and fluorine disposed over said lower adhesion-promoting layer; an upper adhesion-promoting layer disposed over said antifuse material layer ... wherein said lower adhesion-promoting layer and said upper adhesion-promoting layer each have a thickness of between about 2 angstroms and about 20 angstroms.”

Neither McCollum nor Takagi discloses lower and upper adhesion-promoting layers each having a thickness of between about 2 angstroms and about 20 angstroms as recited in Claim 1. Examiner asserts that it would have been obvious to a person of ordinary skill in the art to use the lower adhesion-promoting layer and the upper adhesion-promoting layer each with a thickness of between about 2 angstroms and about 20 angstroms in McCollum’s device in order to optimize the device characteristics according to the requirements of the application in hand. However, Examiner has not provided any evidence of the claimed thickness range being disclosed anywhere in the prior art, nor has Examiner provided evidence of any suggestion or incentive that would motivate one skilled in the art to apply such a limitation to the cited prior art. Merely stating that such a modification would be made in order to optimize the device characteristics without providing any support for this assertion is insufficient to uphold the obviousness rejection. As stated in MPEP 2144.03(A), it “is never appropriate to rely solely on common knowledge in the art without evidentiary support in the record, as the principal evidence upon which a rejection was based.” Broad conclusory statements standing alone are not evidence. MPEP 2144.03(C). Applicants respectfully request that Examiner provide evidence in the prior art of a motivation for modifying the cited prior art to use adhesion-promoting layers with a thickness of between about 2 angstroms and about 20 angstroms, or otherwise withdraw the rejection.

Applicants respectfully submit that Examiner has failed to establish that the cited prior art discloses all of the elements of Claim 1. Furthermore, Examiner has failed to establish that the prior art contains some suggestion or incentive that would have motivated the skilled artisan to modify the prior art as suggested by Examiner. Therefore, Applicants respectfully submit that Claim 1 is non-obvious and patentable over McCollum in view of Takagi.

Since Claims 13 and 16 depend from Claim 1, Applicants respectfully submit that Claims 13 and 16 are also patentable as they contain the same limitations as Claim 1.

Applicants respectfully submit that the same arguments made above with respect to the patentability of Claim 1 are applicable to the patentability of Claim 23 as well.

Since Claim 29 depends from Claim 23, Applicants respectfully submit that Claim 29 is also patentable as it contains the same limitations as Claim 23.

Claim 40 recites a method for programming and erasing a reprogrammable metal-to-metal antifuse, comprising “programming said antifuse ... erasing said antifuse ... and reprogramming said antifuse by applying a programming potential across said antifuse to cause a programming current to flow through said antifuse until its resistance substantially decreases if said erasing step is successful, wherein said erasing step is successful if said antifuse has been returned to a high-resistance state.”

Neither McCollum nor Takagi discloses the step of reprogramming the antifuse if the erasing step is successful as recited in Claim 40. Applicants cannot find, nor has Examiner cited, any mention of this reprogramming step in the prior art. Therefore, Applicants respectfully submit that the cited prior art fails to disclose all of the elements of Claim 40 and that Claim 40 is non-obvious and patentable over McCollum in view of Takagi.

Since Claims 42-46 depend from Claim 40, Applicants respectfully submit that Claims 42-46 are also patentable as they contain the same limitations as Claim 40.

Applicants respectfully submit that Claims 1, 13, 16, 23, 29, 40, and 42-46 are currently in condition for allowance. Reconsideration and withdrawal of the rejection is respectfully requested.

Claims 14-15 and 30-31 stand rejected under 35 U.S.C. §103(a) as being unpatentable over McCollum and Takagi, and further in view of Liu et al. ("A New Metal-to-Metal Antifuse with Amorphous Carbon," IEEE Electron Device Letters, Vol. 19, No. 9, (1998), pp. 317-319).

Since Claims 14-15 depend from Claim 1, Applicants respectfully submit that Claims 14-15 are also patentable as they contain the same limitations as Claim 1.

Since Claims 30-31 depend from Claim 23, Applicants respectfully submit that Claims 30-31 are also patentable as they contain the same limitations as Claim 23.

Therefore, Applicants respectfully submit that Claims 14-15 and 30-31 are currently in condition for allowance. Reconsideration and withdrawal of the rejection is respectfully requested.

Claims 1-3, 6-8, 11-17, 20-22, 29, 34, 40 and 42-46 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Forouhi (US 5,181,096) in view of Liu.

Claim 1 has been amended to incorporate the subject matter of Claim 2 and recites a reprogrammable metal-to-metal antifuse comprising "... a lower adhesion-promoting layer disposed over said lower Ti barrier layer; an antifuse material layer disposed above an upper surface of said lower adhesion-promoting layer, said antifuse material layer selected from a group comprising at least one of amorphous carbon and amorphous

carbon doped with at least one of hydrogen and fluorine disposed over said lower adhesion-promoting layer; an upper adhesion-promoting layer disposed over said antifuse material layer ... wherein said lower adhesion-promoting layer and said upper adhesion-promoting layer each have a thickness of between about 2 angstroms and about 20 angstroms.”

Neither Forouhi nor Liu discloses lower and upper adhesion-promoting layers each having a thickness of between about 2 angstroms and about 20 angstroms as recited in Claim 1., nor does the prior art contain some suggestion or incentive that would have motivated the skilled artisan to modify the cited prior art to include such a limitation. Therefore, Applicants respectfully submit that Claim 1 is non-obvious and patentable over Forouhi in view of Liu.

Since Claims 3, 6-8, 11-17, and 20-22 depend from Claim 1, Applicants respectfully submit that Claims 3, 6-8, 11-17, and 20-22 are also patentable as they contain the same limitations as Claim 1.

Since Claims 29 depends from Claim 23, Applicants respectfully submit that Claim 29 is also patentable as it contains the same limitations as Claim 23.

Applicants respectfully submit that the same arguments made above with respect to the patentability of Claim 1 are applicable to the patentability of Claim 34 as well.

Claim 40 recites a method for programming and erasing a reprogrammable metal-to-metal antifuse, comprising “programming said antifuse ... erasing said antifuse ... and reprogramming said antifuse by applying a programming potential across said antifuse to cause a programming current to flow through said antifuse until its resistance substantially decreases if said erasing step is successful, wherein said erasing step is successful if said antifuse has been returned to a high-resistance state.”

Neither Forouhi nor Liu discloses the step of reprogramming the antifuse if the

erasing step is successful as recited in Claim 1. Applicants cannot find, nor has Examiner cited, any mention of this reprogramming step in the prior art. Therefore, Applicants respectfully submit that the cited prior art fails to disclose all of the elements of Claim 40 and that Claim 40 is non-obvious and patentable over Forouhi in view of Liu.

Since Claims 42-46 depend from Claim 40, Applicants respectfully submit that Claims 42-46 are also patentable as they contain the same limitations as Claim 40.

Applicants respectfully submit that Claims 1, 3, 6-8, 11-17, 20-22, 29, 34, 40, and 42-46 are currently in condition for allowance. Reconsideration and withdrawal of the rejection is respectfully requested.

Claims 23-24 and 27-32 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Forouhi and Liu, and further in view of McCollum.

Applicants respectfully submit that the same arguments made above with respect to the patentability of Claim 1 are applicable to the patentability of Claim 23 as well.

Since Claims 24 and 27-32 depend from Claim 23, Applicant respectfully submits that Claims 24 and 27-32 are also patentable as they contain the same limitations as Claim 23.

Therefore, Applicants respectfully submit that Claims 23-24 and 27-32 are currently in condition for allowance. Reconsideration and withdrawal of the rejection is respectfully requested.

Claims 4-5, 9-10, 18-19, and 33 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Forouhi and Liu, and further in view of Han (US 6,583,953).

Since Claims 4-5, 9-10 and 18-19 depend from Claim 1, Applicants respectfully submit that Claims 4-5, 9-10 and 18-19 are also patentable as they contain the same limitations as Claim 1.

Applicants respectfully submit that the same arguments made above with respect to the patentability of Claim 1 are applicable to the patentability of Claim 33 as well.

Therefore, Applicants respectfully submit that Claims 4-5, 9-10, 18-19, and 33 are currently in condition for allowance. Reconsideration and withdrawal of the rejection is respectfully requested.

Claims 25-26 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Forouhi, Liu and McCollum, and further in view of Han.

Since Claims 25-26 depend from Claim 23, Applicants respectfully submit that Claims 25-26 are also patentable as they contain the same limitations as Claim 23.

Therefore, Applicants respectfully submits that Claims 25-26 are currently in condition for allowance. Reconsideration and withdrawal of the rejection is respectfully requested.

Respectfully submitted,  
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Dated: September 26, 2006

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